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LLNL
FOREIGN TRIP REPORT
LLNL-AR-773572

DATE: May 6, 2019

SUBJECT: Report of Foreign Travel to Sydney, Australia

TO: Dr. Angela Chambers, USDOE Nuclear Criticality Safety Program Manager, National Nuclear Security Administration, NA-511

FROM: Anthony J. Nelson, Nuclear Criticality Safety Engineer, Lawrence Livermore National Laboratory

MEETING TITLES:

- 2018 IEEE Nuclear Science Symposium and Medical Imaging Conference
- 25th International Symposium on Room-Temperature Semiconductor X-Ray & Gamma-Ray Detectors

MEETING LOCATIONS:

- International Convention Centre, Sydney Australia.

MEETING DATES:

November 10-17, 2018

ATTENDEES ON BEHALF OF NCSP:

Anthony Nelson

MEETING BENEFITS TO NCSP:

The 2018 IEEE Nuclear Science Symposium and Medical Imaging Conference (NSS/MIC) was held alongside the 25th International Symposium on Room-Temperature Semiconductor X-Ray & Gamma-Ray Detectors (RTSD), making it one of the largest conferences dedicated to radiation detection instrumentation. There were many dedicated tracks relevant to criticality safety with a specific emphasis on experimental tools and methods including:

- Computing, Software and Simulations for Experiments

- Data Acquisition, Trigger and Front End Electronics Systems
- Gaseous Detectors
- Neutron Detectors and Instrumentation
- Nuclear Instrumentation and Measurement for Reactors and Related Applications
- Nuclear Physics Instrumentation
- Signal and image processing
- Spectroscopic detectors and systems
- Front-end electronics, signal digitization and processing
- Beam instrumentation
- New detectors developments
- Simulation, modeling and hybrid computing
- Semiconductor materials for radiation detectors
- Electronics
- Organic and other Photoconductive Materials for Radiation Detection
- Semiconductor Neutron Detectors

Radiation instrumentation companies from around the world sent vendors to this conference to highlight their product lines at the industrial exhibition. Meeting with these vendors in person proved to be very beneficial in two key ways:

- 1) The Reuter Stokes (RS) representative provided specifications for the detector that was used in the ISSA benchmark experiments. RS had previously been unwilling to provide this information when asked over the phone and through email.
- 2) A number of new neutron detectors were demonstrated that may be very useful for future experiments. In particular, RS has a ^3He detector that is able to detect the axial position of neutron detection, allowing precise spatial information to be measured.

MEETING PURPOSE:

This meeting combined three separate but related conferences into one time and place in order to take advantage of the synergy between the different groups. The three conferences were the Nuclear Science Symposium (NSS), Medical Imaging Conference (MIC), and the 25th International Symposium on Room-Temperature Semiconductor Detectors (RTSD).

Nuclear Science Symposium (NSS)

The 2018 IEEE Nuclear Science Symposium is an annual international conference put on by the IEEE with the goal of providing the opportunity for scientists and engineers working in the field of radiation instrumentation to meet together, present new results and discuss the latest developments in their field, not only with their own colleagues, but also with colleagues from related fields such as medical imaging and room temperature semiconductors. The NSS program emphasizes the latest developments in detector technology, radiation detection, detector materials, new instrumentation techniques, and their implementation in high energy and nuclear physics, astrophysics, accelerators, national nuclear security, and many other applications in various types of radiation environments.

Medical Imaging Conference (MIC)

The IEEE Medical Imaging Conference (MIC) is the premier international forum for discussing the latest engineering, physics and mathematical developments in nuclear medical imaging. Medical imaging is a vibrant, constantly evolving field driven by emerging applications of radiation detectors in medical research

and clinical practice. Information from multiple, complementary imaging modalities is often combined to optimize diagnostic outcomes, motivating novel hardware and software solutions. Similarly, imaging techniques play an increasingly important role in planning, verification and adaptation of radiation therapy. It is in this context that medical imaging researchers and students from all corners of the world come together at the MIC to present their latest work, exchange ideas and establish new connections.

Symposium on Room-Temperature Semiconductor Detectors (RTSD)

The 25th International Symposium on Room-Temperature Semiconductor Detectors (RTSD) represents the largest forum of scientists and engineers developing new solid-state radiation detectors and imaging arrays. Room-temperature semiconductor radiation detectors are finding increasing applications in such diverse fields as medicine, homeland security, astrophysics and environmental remediation. The objective of this conference is to provide a forum for discussion of the state-of-the-art of the detector technology, including materials improvement, material and device characterizations, fabrication, electronics and applications.

The final program for the conference is attached.

	Saturday, 10 Nov. 2018	Sunday, 11 Nov. 2018	Monday, 12 Nov. 2018	Tuesday, 13 Nov. 2018	Wednesday, 14 Nov. 2018	Thursday, 15 Nov. 2018	Friday, 16 Nov. 2018	Saturday, 17 Nov. 2018
7:00 am								
8:00 am	Short Course							
9:00 am								
10:00 am		Workshop						
11:00 am		Workshop						
12:00 pm		Break						
1:00 pm		Workshop						
2:00 pm		Workshop						
3:00 pm		Workshop						
4:00 pm		Workshop						
5:00 pm		Workshop						
6:00 pm								
7:00 pm								
8:00 pm								

Total overview

Sat, 10 Nov, 2018

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Meeting Room C4.1

Meeting Room C4.10

Meeting Room C4.2

Meeting Room C4.3

Meeting Room C4.8

Meeting Room C4.9

	Meeting Room C4.1	Meeting Room C4.10	Meeting Room C4.2	Meeting Room C4.3	Meeting Room C4.8	Meeting Room C4.9
7:00 am						
8:00 am	SC-6 – Image Analysis and Statistics					
9:00 am						
10:00 am		Coffee Break				
11:00 am						
12:00 pm						
1:00 pm						
2:00 pm		NSS-WS3 I – Workshop on Technology Commercialisation				
3:00 pm						
4:00 pm						
5:00 pm		NSS-WS3 II – Workshop on Technology Commercialisation				
6:00 pm						
7:00 pm						
8:00 pm						

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	Cockle Bay I	Cockle Bay II	Darling Harbour Theatre	Meeting Room C3.3	Meeting Room C3.6	Meeting Room C4.1	Meeting Room C4.2	Meeting Room C4.3	Meeting Room C4.5	Park Side Ballroom
7:00 am										
8:00 am										
9:00 am			N-01 – NSS Plenary I							
10:00 am	Coffee Break	Coffee Break	Coffee Break	Coffee Break	Coffee Break				Coffee Break	Coffee Break
11:00 am			N-02 – NSS Plenary II							
12:00 pm										
1:00 pm	Lunch	Lunch	Lunch	Lunch	Lunch	SC-9 – Medical Image Reconstruction: Theory and Practice	SC-8 – GATE, a GEANT4 Based Simulation Toolkit	SC-7 – Advanced Photodetectors	Lunch	Lunch
2:00 pm	N-03 – Photodetectors I	N-04 – Synchrotron and FEL Instrumentation I		N-05 – Creative Computing	N-06 – DAQ, Trigger and FEE I				R-01 – RTSD Opening	
3:00 pm	Coffee Break	Coffee Break	Coffee Break	Coffee Break	Coffee Break				Coffee Break	Coffee Break
4:00 pm									R-02 – RTSD Pixel Detectors	N-07 – NSS Poster I
5:00 pm										
6:00 pm										
7:00 pm										
8:00 pm	NSS Dinner	NSS Dinner								

Total overview	Sat, 10 Nov	Sun, 11 Nov	Mon, 12 Nov	Tue, 13 Nov	Wed, 14 Nov	Thu, 15 Nov	Fri, 16 Nov	Sat, 17 Nov
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	Cockle Bay I	Darling Harbour Theatre	Meeting Room C3.3	Meeting Room C3.4&C3.5	Meeting Room C3.6	Meeting Room C4.5	Meeting Room C4.9	The Gallery
7:00 am								
8:00 am								
9:00 am		N-08 – NSS Plenary III				R-03 – RTSD Detector Systems		
10:00 am	Coffee Break	Coffee Break	Coffee Break	Coffee Break	Coffee Break	Coffee Break	Coffee Break	
11:00 am	N-09 – Nuclear Instrumentation and Measurements for Reactors	JS-01 – NSS-MIC-RTSD Joint Session	N-10 – Nuclear Physics Instrumentation	N-11 – Astrophysics and Space Instrumentation I	N-12 – DAQ, Trigger and FEE II		MIC-WS1 I – New Technologies in Hadron Therapy Workshop	
12:00 pm								
1:00 pm	Lunch	Lunch	Lunch	Lunch	Lunch	Lunch	Lunch	
2:00 pm	N-13 – Analog & Digital Circuits I	JS-02 – NSS-MIC Joint Session	N-14 – Trusting Software?	N-15 – Radiation Damage Effects and Rad Hard Devices			MIC-WS1 II – New Technologies in Hadron Therapy Workshop	
3:00 pm	Coffee Break	Coffee Break	Coffee Break	Coffee Break	Coffee Break	Coffee Break	Coffee Break	
4:00 pm								
5:00 pm		JS-03 – Hadron therapy and microdosimetry Joint Session	N-16 – Experimental Computing	N-17 – Astrophysics and Space Instrumentation II	N-18 – DAQ, Trigger and FEE III	R-04 – RTSD RTSD Award + Crystal Growth		
6:00 pm								
7:00 pm								ER – Exhibitor Reception
8:00 pm								

Total overview	Sat, 10 Nov	Sun, 11 Nov	Mon, 12 Nov	Tue, 13 Nov	Wed, 14 Nov	Thu, 15 Nov	Fri, 16 Nov	Sat, 17 Nov
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	Cockle Bay I	Cockle Bay II	Darling Harbour Theatre	Grand Ballroom	Meeting Room C3.3	Meeting Room C3.4&C3.5	Meeting Room C3.6	Meeting Room C4.4	Meeting Room C4.5	Meeting Room C4.8	Park Side Ballroom
7.00 am											
8.00 am											
9.00 am	N-20 – Instrumentation for Homeland and Nuclear Security I: Active Interrogation and	N-20 – Scintillator Materials I	M-01 – MIC Plenary I: Opening, Keynote Address and Hoffman Award			N-21 – High Energy Physics Instrumentation I				ExPr-I – Exhibitor Presentation	R-05 – RTSD Poster Session
10.00 am	Coffee Break	Coffee Break	Coffee Break		Coffee Break	Coffee Break	Coffee Break	Coffee Break	Coffee Break	Coffee Break	Coffee Break
11.00 am			M-02 – MIC Plenary 2: Keynote Address and Hasegawa Young Investigator Award						R-06 – RTSD Material Characterization	ExPr-II – Exhibitor Presentation	N-22 – NSS Poster II
12.00 pm											
1.00 pm	Lunch	MLT – Machine Learning Tutorial	Lunch		Lunch	Lunch	Lunch	Lunch	Lunch	Lunch	Lunch
2.00 pm	N-23 – Instrumentation for Homeland and Nuclear Security II: Detectors	N-24 – Synchrotron and FEL Instrumentation II			N-25 – Scintillator Detectors I	N-26 – High Energy Physics Instrumentation II			R-07 – RTSD CdZnTe Detectors	ExPr-III – Exhibitor Presentation	M-03 – Poster
3.00 pm	Coffee Break	Coffee Break	Coffee Break		Coffee Break	Coffee Break	Coffee Break	Coffee Break	Coffee Break	Coffee Break	Coffee Break
4.00 pm	N-27 – Neutron Detectors and Instrumentation I	M-04 – New radiation detector technologies 1			N-28 – Gaseous Detectors I - Developments	N-29 – Semiconductor Detectors I	N-30 – Scintillator Materials II	M-05 – Simulation and modelling of imaging systems	R-08 – RTSD - Perovskite Materials	ExPr-IV – Exhibitor Presentation	
5.00 pm											
6.00 pm											
7.00 pm											
8.00 pm				CR – Conference Reception							

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	Cockle Bay I	Cockle Bay II	Darling Harbour Theatre	Meeting Room C3.3	Meeting Room C3.4&C3.5	Meeting Room C4.4	Meeting Room C4.5	Meeting Room C4.9	Park Side Ballroom
7.00 am									
8.00 am									
9.00 am	N-31 – Photodetectors II	N-32 – Semiconductor Detectors II	M-06 – MIC Plenary 3: IEEE NPSS Christopher J. Thompson Student Award Finalists	N-33 – Neutron and Gamma imaging I: Gamma Imaging Techniques and Advancements			R-09 – RTSD TiBr Detectors		
10.00 am	Coffee Break	Coffee Break	Coffee Break	Coffee Break	Coffee Break		Coffee Break		Coffee Break
11.00 am	N-34 – Neutron Detectors and Instrumentation I	N-35 – Analog & Digital Circuits II		N-36 – High Energy Physics Instrumentation III	N-37 – Scintillator Materials III		R-10 – RTSD CdZnTe Detectors 2		M-07 – Poster
12.00 pm									
1.00 pm	Lunch	Lunch	Lunch	Lunch	Lunch	Lunch	Lunch	WIE – Women in Engineering	
2.00 pm	N-38 – Instrumentation for Homeland and Nuclear Security III: Algorithms and Techniques	M-08 – New radiation detector technologies 2		N-39 – Gaseous Detectors II – Developments and Applications	N-40 – Scintillator Detectors II	M-09 – Tomographic image reconstruction 1	R-11 – RTSD Detector Systems 2		
3.00 pm	Coffee Break	Coffee Break		Coffee Break	Coffee Break	Coffee Break	Coffee Break		
4.00 pm									
5.00 pm	N-41 – Neutron Detectors and Instrumentation III	M-10 – High resolution imaging systems		N-42 – Analog & Digital Circuits III	N-43 – Semiconductor Detectors III	M-11 – Clinical emission tomography instrumentation			
6.00 pm									
7.00 pm								STIR-1 – STIR	
8.00 pm									

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	Cockle Bay I	Cockle Bay II	Luna Park	Meeting Room C3.3	Meeting Room C3.4&C3.5	Meeting Room C4.5	Park Side Ballroom
7:00 am							
8:00 am							
9:00 am	M-12 – Multi-modality imaging	M-13 – Tomographic image reconstruction 2		N-44 – Neutron and Gamma Imaging II: Neutron Imaging and Tomography	N-45 – Gaseous Detectors III - Applications	R-12 – RTSD CdTe and GaAs Materials	
10:00 am	Coffee Break	Coffee Break		Coffee Break	Coffee Break	Coffee Break	
11:00 am		N-46 – Closing Session				R-13 – RTSD Closing Session	M-14 – Poster
12:00 pm							
1:00 pm	Lunch	Lunch		Lunch	Lunch	Lunch	
2:00 pm							
3:00 pm	M-15 – Deep learning for image and signal processing	M-16 – CT imaging systems					
4:00 pm	Coffee Break	Coffee Break		Coffee Break	Coffee Break	Coffee Break	
5:00 pm	M-17 – Data corrections and quantitative techniques	M-18 – Imaging in radiotherapy 1		SP – Radiation Instrumentation Educational session			
6:00 pm							
7:00 pm							
8:00 pm			MIC Dinner				

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	Cockle Bay I	Meeting Room C3.5	Meeting Room C3.6	Meeting Room C4.5
7:00 am				
8:00 am				
9:00 am	M-19 – Signal and image processing			M-20 – Imaging in radiotherapy 2
10:00 am	Coffee Break		Coffee Break	Coffee Break
11:00 am	M-21 – Quantification and kinetic modelling			M-22 – New and emerging techniques
12:00 pm				
1:00 pm	Lunch		Lunch	Lunch
2:00 pm	M-23 – MIC Plenary 4: Conference Highlights and Invitation to 2019 MIC	MIC-WS3 – Image Guidance for Radiotherapy: From Today's Best Practice in the Clinic to Future Applications using Synchrotron Radiation		
3:00 pm			MIC-WS2 I – Total-Body PET Imaging Workshop - TBPI	
4:00 pm			MIC-WS2 II – Total-Body PET Imaging Workshop - TBPI	
5:00 pm			MIC-WS2 III – Total-Body PET Imaging Workshop - TBPI	
6:00 pm				
7:00 pm				
8:00 pm				

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